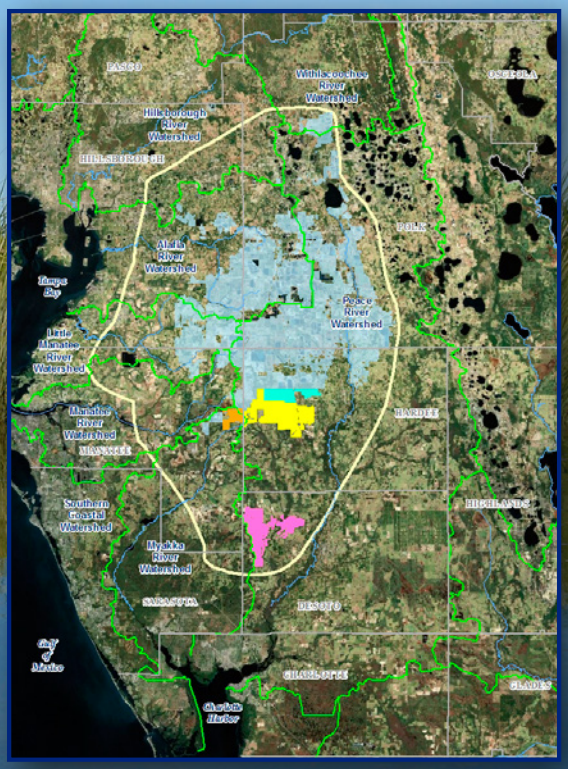
Appendix E
Ecological Resource Impact Analysis Methods and Supplemental Data for the Final AEIS on Phosphate Mining in the CFPD



Ecological Resource Impact Analysis Methods and Supplemental Data for the Final AEIS on Phosphate Mining in the CFPD

PREPARED FOR: U.S. Army Corps of Engineers, Jacksonville District

COPY TO: U.S. Environmental Protection Agency
Florida Department of Environmental Protection

PREPARED BY: CH2M HILL

DATE: January 20, 2013

PROJECT NUMBER: 418237.07.01

1.0 Introduction

The U.S. Army Corps of Engineers (USACE) is conducting investigations to support assembly of an Areawide Environmental Impact Statement (AEIS) focused on four phosphate mining projects proposed by Mosaic Fertilizer LLC and CF Industries Inc. (the Applicants) in the Central Florida Phosphate District (CFPD). This technical memorandum summarizes the methods and approaches used to analyze the potential impacts of the Applicants' Preferred Alternatives and offsite alternatives on ecological resources.

2.0 Ecological Resource Impact Analysis Methods

Ecological resources could be impacted by various aspects of phosphate mining operations, such as land clearing in advance of mining, mining activities, and construction of the infrastructure supporting mining such as access roads, pipeline corridors, and clay settling areas. Ecological effects may be direct such as the clearing of wetlands in areas to be mined, or indirect such as the dewatering of wetlands adjacent to mining areas. The analyses of potential impacts of the Applicants' Preferred Alternatives on ecological resources were primarily based on information included in the Applicants' federal Section 404 permit applications for the proposed mines. The information obtained from the Section 404 permit applications for the impact analyses included field data collected by the Applicants on aquatic biological communities, wetlands/waters, wildlife habitats, and listed species, as well as the Applicants' proposed impact avoidance/minimization measures and compensatory mitigation.

Site-specific field data on ecological resources for the offsite alternatives were unavailable at the time of the preparation of this AEIS. In lieu of collecting field data for each offsite alternative, the following geographic information system (GIS)-based data/tools were used to support the analysis of potential impacts of each offsite alternative on ecological resources:

- 2009 Southwest Florida Water Management District (SWFWMD) Florida Land Use, Cover and Forms Classification System (FLUCCS) data (SWFWMD, 2009a)
- U.S. Geological Survey (USGS) National Hydrography Dataset (NHD) data (USGS, 2013b)
- Critical Lands and Waters Identification Project (CLIP) tool (Florida Natural Areas Inventory [FNAI] et al., 2011)

FLUCCS is the primary system used to classify land use and cover in Florida (see Chapter 3 of the AEIS). For this AEIS, FLUCCS data were used to estimate the spatial coverage (in acres) and composition (types) of wetlands, non-stream surface waters, native uplands (rangelands and upland forests), and agricultural land on each offsite alternative. The comprehensive FLUCCS data for the offsite alternatives are provided in Attachment E-1.

The NHD is a USGS digital-vector dataset used for mapping and geospatial analysis of surface waters (USGS, 2013b). For this AEIS, NHD data were used to estimate the total stream length (in linear feet) on each offsite

alternative. The linear feet of streams were calculated as the combined length of all NHD flowline features except for the "canal/ditch" feature. The comprehensive NHD data for the offsite alternatives are provided in Attachment E-2.

CLIP is a GIS-based tool that allows rapid assessment of the ecological quality and importance of a given parcel of land in Florida. The CLIP User Tutorial includes guidelines for use of CLIP data, including a disclaimer that CLIP data are not intended to be used for regulatory permitting decisions. For this AEIS, CLIP provides estimates of the quality of wetlands on each offsite alternative without the need to obtain permission to access the sites, do field surveys, etc. Any USACE permitting decisions related to this AEIS will be supported by additional data beyond what are available using CLIP, including site-specific, field-verified information.

The CLIP tool was developed through a collaborative effort between the FNAI, University of Florida, and Florida Fish and Wildlife Conservation Commission (FFWCC). The CLIP tool has been revised and updated with new data since its initial creation in 2006. CLIP 2.0, the 2011 update of the tool used for this AEIS, is organized into a set of core GIS data layers that are combined into five resource models: Biodiversity, Landscapes, Surface Water, Groundwater, and Marine. Depending on the model or data layers used, CLIP can provide a broad assessment of the overall ecological quality of an area, or it can provide a more focused assessment of the quality of a specific resource within an area, such a wetlands. According to the CLIP tool, areas or specific resources that are ranked as CLIP Priority 1 or 2 are considered to have the highest priority for conservation significance (FNAI et al., 2011). Because Wetland Rapid Assessment Procedure (WRAP) or Uniform Mitigation Assessment Method (UMAM) data are not available for the offsite alternatives, the CLIP "Wetlands" GIS data layer (which is a component of the CLIP Surface Water model) was used to assess the quality of wetlands on each offsite alternative. The CLIP Wetlands layer has six priority levels, reported from 1 to 6;-Priority 1 represents the highest conservation priority level and Priority 6 represents the lowest conservation priority level. For this AEIS, wetlands ranked as CLIP Priority 1 and 2 were considered to represent wetlands of high quality, wetlands ranked as CLIP Priority 3 and 4 were considered to represent wetlands of moderate quality, and wetlands ranked as CLIP Priority 5 and 6 were considered to represent wetlands of low quality on each offsite alternative. Accordingly, the percentages of wetlands ranked as CLIP Priority 1 and 2 (high-quality wetlands), wetlands ranked as CLIP Priority 3 and 4 (moderate-quality wetlands), and wetlands ranked as CLIP Priority 5 and 6 (low-quality wetlands) were calculated for each offsite alternative. The comprehensive CLIP Wetland data for the offsite alternatives are provided in Attachment E-3.

3.0 Supplemental Information Appended to this Technical Memorandum

The following attachments include supplemental information that supports the ecological resource impact analyses conducted for the offsite alternatives: Attachment E-1 – FLUCCS Data for Offsite Alternatives; Attachment E-2 – NHD Data for Offsite Alternatives; and Attachment E-3 – CLIP Data for Offsite Alternatives.

Attachment E-1
FLUCCS Data for Offsite Alternatives

This page intentionally left blank.

Attachment E-1: Estimated Land Use/Cover on Offsite Alternatives Based on SWFWMD FLUCCS Data

Pine Level/Keys Tract

Land Use	FLUCCS Code	Acreage	Percentage	FLUCCS Description
Urban/Built-Up	110	425.3746983	1.721378682	Residential Low Density < 2 Dwelling Units
Urban/Built-Up	150	39.85822469	0.161295673	Industrial
Urban/Built-Up	180	5.526471321	0.022364165	Recreational
Agriculture	210	6460.431139	26.14365283	Cropland And Pastureland
Agriculture	214	2322.496556	9.39852811	Row Crops
Agriculture	220	995.8440794	4.029917095	Tree Crops
Agriculture	240	9.167720921	0.037099337	Nurseries And Vineyards
Agriculture	250	83.63839189	0.338462408	Specialty Farms
Agriculture	260	1977.622148	8.002912774	Other Open Lands <Rural>
Rangeland	310	19.83377474	0.080262031	Herbaceous
Rangeland	320	3091.108979	12.50889891	Shrub And Brushland
Rangeland	330	288.9690776	1.169381281	Mixed Rangeland
Upland Forest	410	23.73773454	0.096060321	Upland Coniferous Forest
Upland Forest	411	1657.568475	6.707740371	Pine Flatwoods
Upland Forest	420	47.4632514	0.192071201	Upland Hardwood Forests - Part 1
Upland Forest	434	971.7060497	3.932236885	Hardwood Conifer Mixed
Water	530	17.80624114	0.072057139	Reservoirs
Wetland	615	2047.241551	8.284644049	Stream And Lake Swamps (Bottomland)
Wetland	620	19.5638399	0.079169676	Wetland Coniferous Forests
Wetland	621	126.4474664	0.511699388	Cypress
Wetland	630	75.75382012	0.306555636	Wetland Forested Mixed
Wetland	641	2875.499294	11.63638365	Freshwater Marshes
Wetland	643	1120.524246	4.534464688	Wet Prairies
Wetland	644	7.563619472	0.030607964	Emergent Aquatic Vegetation
Wetland	653	0.532715006	0.002155756	Intermittent Ponds
Total		**24711.27956**	**100**	
Total Agriculture		**11849.20**	**47.95**	
Pastureland		**6460.43**	**26.14**	
Total Native Uplands		**6100.39**	**24.69**	
Rangeland		**3399.91**	**13.76**	
Upland Forest		**2700.48**	**10.93**	
Water		**17.81**	**0.07**	
Total Wetlands		**6273.13**	**25.39**	
Forested Wetlands		**2269.01**	**9.18**	
Non-forested Wetlands		**4004.12**	**16.20**	

Pioneer Tract

Land Use	FLUCCS Code	Acreage	Percentage	FLUCCS Description
Urban/Built-up	110	56.85081569	0.225075762	Residential Low Density < 2 Dwelling Units
Urban/Built-up	150	3.090107974	0.012233921	Industrial
Agriculture	210	7022.099571	27.80091001	Cropland And Pastureland
Agriculture	214	59.91144584	0.237192979	Row Crops
Agriculture	220	4586.088597	18.15659762	Tree Crops
Agriculture	240	0.025394016	0.000100536	Nurseries And Vineyards
Agriculture	260	1306.475716	5.172415093	Other Open Lands <Rural>
Rangeland	310	33.02267702	0.130738743	Herbaceous
Rangeland	320	1498.807486	5.933868014	Shrub And Brushland
Rangeland	330	323.1601718	1.279410348	Mixed Rangeland
Upland Forest	411	697.9191137	2.763103296	Pine Flatwoods
Upland Forest	420	70.68855947	0.279860213	Upland Hardwood Forests - Part 1
Upland Forest	434	583.4960037	2.310095396	Hardwood Conifer Mixed
Water	510	0.212409738	0.000840943	Streams And Waterways
Water	520	23.94948552	0.094817438	Lakes
Water	530	11.2818808	0.044665637	Reservoirs
Wetland	615	6084.387619	24.0884526	Stream And Lake Swamps (Bottomland)
Wetland	621	189.6750575	0.750934838	Cypress
Wetland	630	0.071755467	0.000284084	Wetland Forested Mixed
Wetland	641	2121.518867	8.399219422	Freshwater Marshes
Wetland	643	557.8205708	2.208444829	Wet Prairies
Wetland	644	19.50400458	0.077217515	Emergent Aquatic Vegetation
Transportation/Utilities	810	0.264971905	0.00104904	Transportation
Transportation/Utilities	830	8.201875155	0.032471712	Utilities
Total		**25258.52416**	**100**	
Total Agriculture		**12974.60**	**51.37**	
Pastureland		**7022.10**	**27.80**	
Total Native Uplands		**3207.09**	**12.70**	
Rangeland		**1854.99**	**7.34**	
Upland Forest		**1352.10**	**5.35**	
Water		**35.44**	**0.14**	
Total Wetlands		**8972.98**	**35.52**	
Forested Wetlands		**6274.13**	**24.84**	
Non-forested Wetlands		**2698.84**	**10.68**	

A-2

Land Use	FLUCCS Code	Acreage	Percentage	FLUCCS Description
Agriculture	210	4145.876146	50.62922961	Cropland And Pastureland
Agriculture	214	110.8275849	1.353420856	Row Crops
Agriculture	220	967.2960843	11.81257081	Tree Crops
Agriculture	240	20.85646507	0.254698096	Nurseries And Vineyards
Agriculture	260	1217.064215	14.86272658	Other Open Lands <Rural>
Rangeland	320	146.3031581	1.78664676	Shrub And Brushland
Rangeland	330	3.661687654	0.044716344	Mixed Rangeland
Upland Forest	411	152.9057522	1.867277305	Pine Flatwoods
Upland Forest	420	12.81602844	0.156508691	Upland Hardwood Forests - Part 1
Upland Forest	434	37.68740612	0.460236696	Hardwood Conifer Mixed
Water	530	12.19566612	0.148932857	Reservoirs
Wetland	615	438.3076443	5.352590763	Stream And Lake Swamps (Bottomland)
Wetland	621	3.479969687	0.042497214	Cypress
Wetland	630	50.66144012	0.618674942	Wetland Forested Mixed
Wetland	641	643.9360354	7.863714265	Freshwater Marshes
Wetland	643	221.2375857	2.701742196	Wet Prairies
Wetland	644	3.587963152	0.043816024	Emergent Aquatic Vegetation
Total		**8188.700832**	**100**	
Total Agriculture		**6461.92**	**78.91**	
Pastureland		**4145.88**	**50.63**	
Total Native Uplands		**353.37**	**4.32**	
Rangeland		**149.96**	**1.83**	
Upland Forest		**203.41**	**2.48**	
Water		**12.20**	**0.15**	
Total Wetlands		**1361.21**	**16.62**	
Forested Wetlands		**492.45**	**6.01**	
Non-forested Wetlands		**868.76**	**10.61**	

W-2

Land Use	FLUCCS Code	Acreage	Percentage	FLUCCS Description
Agriculture	210	1469.608244	15.12058408	Cropland And Pastureland
Agriculture	214	1884.179029	19.3860422	Row Crops
Agriculture	220	9.665640364	0.099448359	Tree Crops
Agriculture	240	0.39538164	0.004068024	Nurseries And Vineyards
Agriculture	260	1042.019334	10.72118438	Other Open Lands <Rural>
Rangeland	310	8.699946142	0.089512472	Herbaceous
Rangeland	320	1352.996906	13.9207871	Shrub And Brushland
Rangeland	330	93.21213533	0.959046015	Mixed Rangeland
Upland Forest	410	38.36780253	0.394760703	Upland Coniferous Forest
Upland Forest	411	681.8986821	7.015955714	Pine Flatwoods
Upland Forest	420	55.02061323	0.566099035	Upland Hardwood Forests - Part 1
Upland Forest	434	465.8342388	4.792900288	Hardwood Conifer Mixed
Water	520	0.69357877	0.00713613	Lakes
Water	530	34.03324794	0.350163106	Reservoirs
Wetland	610	3.578039461	0.036813924	Wetland Hardwood Forests
Wetland	615	776.45203	7.988801268	Stream And Lake Swamps (Bottomland)
Wetland	621	32.73951352	0.336852062	Cypress
Wetland	630	13.46053111	0.138493434	Wetland Forested Mixed
Wetland	641	1562.503858	16.07637345	Freshwater Marshes
Wetland	643	116.7520033	1.20124427	Wet Prairies
Wetland	644	32.16247796	0.330915027	Emergent Aquatic Vegetation
	740	44.98255892	0.462818963	Disturbed Land
Total		**9719.255792**	**100**	
Total Agriculture		**4405.87**	**45.33**	
Pastureland		**1469.61**	**15.12**	
Total Native Uplands		**2696.03**	**27.74**	
Rangeland		**1454.91**	**14.97**	
Upland Forest		**1241.12**	**12.77**	
Water		**34.73**	**0.36**	
Total Wetlands		**2537.65**	**26.11**	
Forested Wetlands		**826.23**	**8.50**	
Non-forested Wetlands		**1711.42**	**17.61**	

Attachment E-2
NHD Data for Offsite Alternatives

This page intentionally left blank.

Attachment E-2: Estimated Total Stream Lengths for Offsite Alternatives Based on USGS NHD Data

(Total Stream Length = Sum Of All Flowline Features Minus "Canal/Ditch" Feature)

Pine Level/Keys Tract

Flowline Feature	Linear Feet
Artificial Path	78,425
Canal / Ditch	378,428
Connector	1,945
Stream/River: Hydrgraphic Category = Intermittent	64,775
Stream/River: Hydrgraphic Category = Perennial	64,804
Total Linear Feet	**588,376**
Total linear Feet Minus Canal/Ditch	**209,949**

Pioneer Tract

Flowline Feature	Linear Feet
Artificial Path	41,367
Canal / Ditch	42,639
Connector	11,16
Stream/River: Hydrgraphic Category = Intermittent	93,394
Stream/River: Hydrgraphic Category = Perennial	194,649
Total Linear Feet	**373,165**
Total linear Feet Minus Canal/Ditch	**330,526**

A-2

Flowline Feature	Linear Feet
Artificial Path	17,765
Canal / Ditch	118,579
Connector	90
Stream/River: Hydrgraphic Category = Intermittent	40,078
Stream/River: Hydrgraphic Category = Perennial	502,92
Total Linear Feet	**226,805**
Total linear Feet Minus Canal/Ditch	**108226**

W-2

Flowline Feature	Linear Feet
Artificial Path	36,539
Canal / Ditch	2,05011
Connector	157
Stream/River: Hydrgraphic Category = Intermittent	19,191
Stream/River: Hydrgraphic Category = Perennial	5,2393
Total Linear Feet	**313,291**
Total linear Feet Minus Canal/Ditch	**108,280**

Grand Total Linear Feet	**1,501,636.618**
Grand Total Linear Feet Minus Canal/Ditch	**756,980.0578**

Flowline Descriptions

Artificial Path: A feature that represents flow through a two-dimensional feature, such as a lake or a double-banked stream.

Canal / Ditch: A canal or ditch (usually with a concrete or earthen surround).

Connector: A known, but nonspecific connection between two nonadjacent network segments

Stream/River: Hydrgraphic Category = Intermittent: Intermittent streams

Stream/River: Hydrgraphic Category = Perennial: Permanent/perennial streams or rivers.

Attachment E-3
CLIP Data for Offsite Alternatives

This page intentionally left blank.

Attachment E-3: Estimated Wetland Quality on Offsite Alternatives Based on CLIP Wetland Priority Rankings

Pine Level/Keys Tract

CLIP Wetland Priority	Acreage
0	18,584.68434
1	415.0427162
2	1,211.824654
3	2,136.816706
4	1,741.733847
5	439.0612632
6	186.5885272
Total Site Acres	**24,715.75205**
Total Wetland Acres	**6,131.067714**

% of Wetlands Ranked as CLIP Priority 1 and 2 (High Quality) = 26.53

% of Wetlands Ranked as CLIP Priority 3 and 4 (Moderate Quality) = 63.26

% of Wetlands Ranked as CLIP Priority 5 and 6 (Low Quality) = 10.20

Pioneer Tract

CLIP Wetland Priority	Acreage
0	16,365.52627
1	1,220.887208
2	2,807.278878
3	3,032.174764
4	1,086.950449
5	529.2420114
6	216.3337185
Total Site Acres	**25,258.3933**
Total Wetland Acres	**8,892.867028**

% of Wetlands Ranked as CLIP Priority 1 and 2 (High Quality) = 45.30

% of Wetlands Ranked as CLIP Priority 3 and 4 (Moderate Quality) = 46.32

% of Wetlands Ranked as CLIP Priority 5 and 6 (Low Quality) = 8.38

A-2

CLIP Wetland Priority	Acreage
0	6,841.060411
2	122.9838564
3	142.8881153
4	393.9152906
5	408.8156855
6	281.4395485
Total Site Acres	**8,191.102907**
Total Wetland Acres	**1,350.042496**

% of Wetlands Ranked as CLIP Priority 1 and 2 (High Quality) = 9.11

% of Wetlands Ranked as CLIP Priority 3 and 4 (Moderate Quality) = 39.76

% of Wetlands Ranked as CLIP Priority 5 and 6 (Low Quality) = 51.13

W-2

CLIP Wetland Priority	Acreage
0	7,215.460632
1	2.001545584
2	504.834275
3	1,532.127546
4	322.137642
5	112.0309542
6	31.30194899
Total Site Acres	**9,719.894544**
Total Wetland Acres	**2,504.433912**

% of Wetlands Ranked as CLIP Priority 1 and 2 (High Quality) = 20.24

% of Wetlands Ranked as CLIP Priority 3 and 4 (Moderate Quality) = 74.04

% of Wetlands Ranked as CLIP Priority 5 and 6 (Low Quality) = 5.72